

## CLAIMS

1. SYSTEM FOR MEASUREMENT OF OPTICAL PARAMETERS  
AND CHARACTERIZATION OF MULTIPOINT OPTICAL DEVICES  
constituted by process control systems, one or more sources of optical  
5 test signal (tunable laser source), optical circuit including optical fiber  
and several other optical components arranged so as to constitute an  
interferometric optical arrangement, optical connectors, optoelectronic  
interfaces, photodetectors, analogical electronic circuits, digital  
electronic circuits for digital signal processing and electronic circuits  
10 for data acquisition, characterized by the fact that the test and  
reference optical signals traverse paths with any lengths, that can be  
identical or distinct, the optical signal traversing at least one of said  
paths of interferometer being phase- and/or frequency-modulated.

2. METHOD FOR MEASUREMENT OF OPTICAL PARAMETERS  
15 AND CHARACTERIZATION OF MULTIPOINT OPTICAL DEVICES based  
in optical interferometry concept, using two optical paths in which in  
one of these the device under test (DUT) is inserted, and in which one  
or more optical phase / frequency modulators are inserted,  
characterized by the fact that the signals of both arms are summed at a  
20 same photodetector that translates to the electric domain the  
heterodyning of the optic signals, which contain the information of the  
optical characteristics of the DUT.

3. METHOD FOR MEASUREMENT OF OPTICAL PARAMETERS  
AND CHARACTERIZATION OF MULTIPOINT OPTICAL DEVICES as  
25 claimed in claim 2, characterized by the fact that the system operates  
equally well with continuous wavelength sweeping as with step  
wavelength sweeping of the tunable laser source.

4. METHOD FOR MEASUREMENT OF OPTICAL PARAMETERS  
AND CHARACTERIZATION OF MULTIPOINT OPTICAL DEVICES as  
30 claimed in claim 2, characterized by the capability of simultaneous

interferometric characterization in reflection and transmission of all ports of multi-port optical devices using phase and/or frequency optical modulators in the arms of the interferometer.

5 5. METHOD FOR MEASUREMENT OF OPTICAL PARAMETERS  
AND CHARACTERIZATION OF MULTI-PORT OPTICAL DEVICES as  
claimed in claim 4, characterized by the capability of determining the  
polarization characteristics of the DUT for the two orthogonal  
polarization modes of light, the polarization discrimination being  
provided by distinct phase and/or frequency modulators installed in  
10 the interferometer arms.

6. METHOD FOR MEASUREMENT OF OPTICAL PARAMETERS  
AND CHARACTERIZATION OF MULTI-PORT OPTICAL DEVICES as  
claimed in claim 2, characterized by the fact that the transfer of the  
optical signals between the diverse ports of the DUT is described by  
15 means of the Optical "S"-Parameters where each "S<sub>xy</sub>" parameter is  
represented using the formalism of Jones (Jones matrix) and/or the  
formalism of Müller (Müller matrix) and where all the determinations of  
the optical characteristics of the DUT (bandwidth, phase, time delay,  
chromatic dispersion, 2<sup>nd</sup> order chromatic dispersion, reflectance,  
20 reflection coefficient, transmittance of the port "y" to the port "x" and  
vice versa, transmission coefficient of the port "y" to the port "x" and  
vice versa, insertion loss, polarization dependent loss, polarization  
mode dispersion (DGD/PMD), 2<sup>nd</sup> order DGD, etc.) are based on said  
"S<sub>xy</sub>" parameters.

25 7. METHOD FOR MEASUREMENT OF OPTICAL PARAMETERS  
AND CHARACTERIZATION OF MULTI-PORT OPTICAL DEVICES as  
claimed in claim 4, characterized by the fact of the measurement of the  
different optical parameters in the different propagation paths is  
furnished by the arrangement of the optical interferometric circuits  
30 according to different optical configurations, each individual

configuration corresponding to the measurement of a specific optical "S"-parameter of interest.

8. METHOD FOR MEASUREMENT OF OPTICAL PARAMETERS AND CHARACTERIZATION OF MULTI-PORT OPTICAL DEVICES as  
5 claimed in claim 7, characterized by the fact of the optical interferometric circuitry is equivalent to the overlapping several individual optical configurations related to the simultaneous measurement of several optical "S"-parameters.

9. METHOD FOR MEASUREMENT OF OPTICAL PARAMETERS  
10 AND CHARACTERIZATION OF MULTI-PORT OPTICAL DEVICES as claimed in claim 4, characterized by the fact that the complete determination of the transference matrix ("S"- parameter matrix) of multi-port optical devices is based on the concurrent use of optical techniques (interferometry, polarization diversity, phase and/or  
15 frequency optical modulation, optical beam coupling and division, generation of optical signal, signal beating, photodetection etc.), usual analogical and digital electronics techniques (generation of modulating signals, amplification, analogical filtering, digital filtering, "analogical Lock-in" technique, digital "lock-in" technique, analogical signal  
20 processing, digital signal processing, FFT techniques - "Fast Fourier Transform", digital communication etc.) and specific software (software for data acquisition, data analysis, processing of results, graphic user interface software etc.).

10. METHOD FOR MEASUREMENT OF OPTICAL PARAMETERS  
25 AND CHARACTERIZATION OF MULTI-PORT OPTICAL DEVICES as claimed in claim 4, characterized by the fact of the interferometric optical circuits stabilization against thermal variations or mechanical vibration is provided by means of the use of a second interferometer operating within the optical test circuits, functioning in a wavelength  
30 falling outside the test wavelength band, operating according to the WDM (wavelength division multiplexing) techniques.

11. SYSTEM FOR MEASUREMENT OF OPTICAL PARAMETERS  
AND CHARACTERIZATION OF MULTIPOINT OPTICAL DEVICES as  
claimed in claim 1, characterized by the fact of the optical  
interferometer can be comprise different physical paths for propagation  
5 and conduction of the optical signal, such as: optical fibers, planar  
waveguides, free space (FSO) etc..

12. SYSTEM FOR MEASUREMENT OF OPTICAL PARAMETERS  
AND CHARACTERIZATION OF MULTIPOINT OPTICAL DEVICES as  
claimed in claims 1 or 10, characterized by the use of optical phase  
10 and/or frequency modulators in the arms of the interferometer, said  
modulators being constructed according to using any known possible  
technologies, such as techniques of refractive index change, acusto-  
optic effect in crystals, length propagation changes, electron-optic effect  
etc..